NOTICE

All drawings located at the end of the document.

QUARTERLY REPORT

FOR OCTOBER THROUGH DECEMBER 1993

OPERABLE UNIT 2
IM/IRA SURFACE WATER
FIELD TREATABILITY UNIT

PREPARED BY

EG&G ROCKY FLATS
ENVIRONMENTAL RESTORATION
ENVIRONMENTAL OPERATIONS MANAGEMENT

JANUARY 1994

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Quarterly Operations Report for October Through December of 1993

at

Operable Unit No 2 IM/IRA Field Treatability Unit

1 0 INTRODUCTION

This report covers operations of the Field Treatability Unit (FTU) for the fourth quarter of 1993 It is the fifth Quarterly Report to be prepared for this facility

The FTU is being operated as an Interim Measure/Interim Remedial Action (IM/IRA) under the Plan released by the Department of Energy (DOE) on May 8, 1991 The FTU began operation as Phase I for treatment of surface water from a portion of the South Walnut Creek drainage at OU-2 for removal of volatile organic compounds (VOCs) of concern The Phase I system consisted of collection facilities at Surface Water locations SW-59 and SW-61, equalization tankage, bag pre-filters, granular activated carbon (GAC) treatment units and insulated, heat traced transfer piping, pumps, and controls Phase I was conducted between May 13, 1991 and April 27, 1992 at which time the Radionuclides Removal System (RRS) was implemented under the Phase II program The RRS added provisions for treatment of radionuclides and metals by pH adjustment, chemical precipitation and cross-flow membrane filtration The RRS replaced bag pre-filters as pretreatment to the GAC system Detailed descriptions of the FTU and its operation can be found in the IM/IRAP, the Field Sampling Plan (FSP), and related documentation The Field Treatability Study, Phase II (draft) for the South Walnut Creek Basin Surface Water Interim Measure/Interim Remedial Action report contains a detailed operating history of the FTU prior to this reporting period

2.0 TREATMENT FACILITY PERFORMANCE

2 1 QUANTITY OF WATER TREATED

The FTU collects surface water from three sources, Surface Water 59, 61, and 132 Collection occurs twenty four hours per day, 375 days per year Collected water is stored in a ten thousand gallon double walled poly-propylene equalization tank until enough water is present to justify initiating a batch treatment The FTUs goal is to collect all water from the three weirs, up to 60 gallons per minute total, and treat the water to remove all contaminants to below

Applicable or Relevant and Appropriate Requirements (ARAR) limits Table 1 in Appendix A lists the appropriate ARARs for the OU-2 FTU A total of 2,141,940 gallons of water was treated at the FTU during this reporting period

The following illustrates the volume of water collected for treatment during this reporting period

	Location	Month Total	Daily Average	Gallons per Min
October	SW-59	21,604 gal	697 gal	0 48
	SW-61,132	611,415 gal	19,723 gal	13 69
November	SW-59	14,227 gal	593 gal	0 41
	SW-61,132	855,770 gal	27,605 gal	24 76
December	All weirs	638,925 gal	20,288 gal	14 09

The weirs operated properly without incident During high precipitation events, it is not uncommon for the flows to exceed the 60 gallon per minute collection rate All water in excess of 60 gallons per minute is allowed to overflow the weirs

2.2 CHEMICAL USAGE

Chemical usage for operations of the FTU were as follows

Month	Sulfuric Acid	Calcium Hydroxide	Ferric Sulfate	Peroxide(H_2O_2)
October	99 3 gallons	1,690 lbs	322 lbs	105 gallons
November	117 gallons	2,550 lbs	465 lbs	45 gallons
December	87 gallons	1,200 lbs	290 lbs	58 gallons

2 3 WASTE GENERATION

The sludge generated at the OU-2 FTU is handled and packaged as low-level radioactive mixed waste A total of forty-four drums were packaged this quarter

Approximately two 55-gallon bags of Personnel Protective Equipment (PPE) is generated per month, with eight bags generated during the quarter The PPE is monitored for contaminants, and if determined clean for unrestricted release, sent to the Rocky Flats Plant Landfill for disposal

2.4 OPERATING COSTS

Operations and maintenance (O&M) of the FTU is performed by Resource Technology Group, Inc (RTG), a subcontractor under the Master Task Subcontract (MTS) system By utilizing subcontract labor, EG&G is able to operate the FTU at a significantly lower cost, while still providing qualified personnel Average burdened labor costs for EG&G operators is approximately $95/hour, whereas subcontract labor for O&M averages $38/hour MTS subcontractors bring many years operating experience on similar systems, and must complete the same training as EG&G personnel The EG&G project manager oversees all of the FTUs operations, and provides input into the operations of the unit

Monthly operating costs for subcontractor labor and supplies (including chemicals) were as follows

October	$83,460
November	$81,159
December	$81,341

2 5 POWER

Power for the FTU is provided by a portable 250-kW diesel generator On September 15, 1993 the generator was replaced with a backup generator provided by Plant Power The replacement generator experienced several shutdowns from mechanical troubles during the previous quarter, and was replaced on October 12, 1993 with a twin generator set that has provided power throughout the quarter The 250 kW generator is currently being rebuilt offsite, and scheduled for delivery back to the FTU in January 1994

EOM is still pursuing installation of permanent plant power to the FTU The installation of permanent power will eliminate most all of the shutdowns that the FTU experiences Construction is anticipated to commence during the end of the first quarter of 1994

2 6 PREVENTATIVE MAINTENANCE

During this reporting period a rigorous preventative maintenance program monitored all process equipment at the FTU All process equipment at the FTU is being characterized and evaluated for preventative maintenance frequency, spare parts requirements, and impacts on the system from individual equipment failure A preventative maintenance computer program tracks all planned maintenance activities and helps to assure that all equipment is properly maintained

Replacement pressure gauges were ordered and entered into the plant calibration program The gauges will be installed and calibrated on an annual basis to assure accurate pressure indications

Replacement parts and equipment for vital equipment have been ordered All vital equipment (except for the main process pump) will have replacement parts/equipment onsite once all of the items that have been ordered are received This will significantly reduce any down time due to equipment failure

Due to pre-planning of scheduled and off-normal maintenance, the majority of the maintenance is being performed within a limited time frame to prevent any periods of non-collection

2 7 PERIODS OF NON-COLLECTION

Periods of non-collection are periods when for some reason the collection weir pumps cannot collect all collected surface water (up to 60 gallons per minute) and transfer it to the equalization tank for storage and later treatment

Periods of non-collection are listed below

Date	Duration	Cause
10/06/93	1 hr 15 min	Generator preventive maintenance
10/11/93	4 hr 17 min	Diesel spill response shutdown generators
10/12/93	5 hr 30 min	Generator failed, replaced with another set
10/18/93	4 hr 45 min	Poor membrane flows
10/31/93	1 hr 45 min	Generator preventive maintenance
11/01/93	40 min	Poor membrane flows
11/02/93	2 hr 05 min	Poor membrane flows
11/14/93	15 min	Poor membrane flows
11/15/93	123 hr 25 min	Membrane rupture See Appendix B
11/21/93	10 hr 05 min	Influent line pulled apart
11/24/93	2 hr 30 min	Acid delivery line for tank TK-11 froze
12/6/93	51 hr 50 min	Repairs to the influent line
12/21/93	1 hr	Generator problems

A great deal of shutdown was experienced for a variety of reasons during this quarter Changes have been made to reduce shutdown times to a minimum Periods of non-collection for the first month of the next reporting period were less than five hours at the time this report was prepared EG&G is attempting to reduce/eliminate any periods of non-collection by improving process equipment and planning shutdowns that can be performed while the influent equalization tank is filling The addition of extra membranes to the Rads Removal System has increased throughput and decreased operating time

3 0 SAMPLING

3 1 SAMPLING OBJECTIVES

Characterization of the water from the three weirs (SW 59, 61, and 132) indicates the

presence of radionuclides, heavy metals, volatile organic compounds (VOCs), and suspended solids to which contamination may be absorbed The Interim Remedial Action Plan (IRAP) identified specific contaminants of concern and established possible chemical-specific ARARs as effluent standards for discharge of the treated water Associated ARARs are presented in Table 1 located in Appendix A

Sampling at the FTU is performed to characterize the influent surface water, wastes, and effluent water, as well as to initiate optimization of FTU operations to minimize chemical consumption and waste generation

Preliminary sample results showing contaminants exceeding ARARs are presented below, as well as contaminants not associated with ARARs that are present in the water stream above detection levels

Samples that have been analyzed to date for this quarter have not been validated Sample results contained in this report are unvalidated, and are presented to provide a general scope of the contaminants treated at the facility Additionally, the last quarterly report stated that validated data would be presented in the next reporting period, however, most of that data has not undergone the validation process and will be presented in a future report

3 2 RS-1 (UNTREATED INFLUENT WATER FROM WEIRS)

Below is a breakdown of contaminants detected in the water from the sampling location RS-1

Chemical	Detects	Detects >ARAR	Units	High Value	Average[1]	ARAR
VOCs						
1,1-Dichloroethane	2	0	ug/l	1 0	0 66	
1,1-Dichloroethene	2	0	ug/l	4 0	1 52	7 00
1,1,1-Trichloroethane	2	-	ug/l	8	3 26	-
Carbon Tetrachloride	2	2	ug/l	120	107	5 00
Chloroform	2	2	ug/l	20	18	1 00
Tetrachloroethene	2	2	ug/l	52	46	1 00
Trichloroethene	2	2	ug/l	58	53 5	5 00
cis-1,2-Dichloroethene	2	-	ug/l	42	40 5	-

[1] Average value calculated by taking all values (for non-detect, 1/2 the detection limit was used) and dividing the value by the number of samples

- No ARARs exist for this chemical at the FTU

RS-1 (UNTREATED INFLUENT WATER FROM WEIRS) CONTINUED

Chemical	Detects	Detects >ARAR	Units	High Value	Average[1]	ARAR
Metals						
Aluminum	2	1	ug/l	1230	409	200
Iron	4	1	ug/l	1400	509	1000
Lead	1	0	ug/l	3 5	2 75	5 00
Manganese	4	0	ug/l	43	28 5	1000
Zinc	4	4	ug/l	145	122	50 0

[1] Average value calculated by taking all values (for non-detect, 1/2 the detection limit was used) and dividing the value by the number of samples

Radionuclides

Radionuclide data was not received for this reporting period prior to preparation of this report Radiological data for samples exceeding ARARs taken from January 5, 1993 through September 28, 1993 are presented below

DATE	Radionuclide	Unit	Concentration	Error	ARAR
1/19/93	U-total	pCi/l	10 56	1 32	10 00
2/16/93	U-total	pCi/l	10 25	1 31	10 00
3/16/93	Pu239/240	pCi/l	0 06727	0 0516	0 05
3/23/93	Gross α	pCi/l	16 71	6 77	11 00
3/23/93	Pu239/240	pCi/l	0 1001	0 0614	0 05
3/31/93	Am241	pCi/l	0 1111	0 023	0 05
3/31/93	Pu239/240	pCi/l	0 339	0 0508	0 05
5/11/93	Gross α	pCi/l	10 72	3 26	10 00
9/28/93	Gross α	pCi/l	17	12	10 00
9/28/93	Gross β	pCi/l	20	8 1	19 00

3 3 RS-5 (TREATED EFFLUENT FROM CHEMICAL PRECIPITATION/MICROFILTRATION PRIOR TO GAC)

Analysis of the received sample data for this quarter indicates that no ARARs were exceeded for VOCs and metals at this sample point Radionuclide data have not been received for this reporting period

Radiological data for samples exceeding ARARs taken from January 5, 1993 through September

28, 1993 (previous reporting periods) is presented below

DATE	Radionuclide	Unit	Concentration	Error	ARAR
1/19/94	Gross α	pCi/l	10 98	3 9	10 00

3 4 RS-6 (LEAD GAC EFFLUENT)

Review of the received sample data for this quarter indicates that chloroform exceeded ARARS on two consecutive weeks, with values of 6 4 ug/l and 12 ug/l Effluent samples (RS-7) on the same sample dates verified that the polish GAC unit removed all contaminants below ARAR values The GAC was monitored for breakthrough (effluent of lead GAC approaching ARAR level for any compound) of the lead unit When breakthrough is achieved, the old polish unit becomes the lead unit, and a new (virgin) unit becomes the polish The lead GAC unit was replaced on 12/11/93, for a total of 205 days of service This is the first unit that has been replaced based on analytical results Previous GAC changeout was performed every 120 days Monitoring for breakthrough will continue to assure that the GAC units are fully utilized prior to replacement

3 5 RS-7 (TREATED EFFLUENT)

No ARAR values were exceeded for VOCs or metals at the discharge point RS-7 for the FTU during the fourth quarter of 1993 Radionuclide data for this reporting period have not been received for this sample location

Radiological data for samples exceeding ARARs taken from January 5, 1993 through September 28, 1993 are presented below

DATE 4/6/93 SAMPLE # FT00555REU2

Radionuclide	Unit	Concentration	Error	ARAR
Am-241	pCi/l	0 074	0 0208	0 05
Gross α	pCi/l	13 12	4 02	11 00
Pu-239/240	pCi/l	0 1141	0 0253	0 05
U-total*	pCi/l	9 18	1 729	10 00

* Error range could place concentration above ARAR limit

DATE 6/18/93 SAMPLE # FT20010RG

Radionuclide	Unit	Concentration	Error	ARAR
Gross α	pCi/l	13 6	4 5	11 00
U-total	pCi/l	15 7	3 46	10 00

EG&G is investigating the cause of the radionuclides exceeding ARAR levels Influent samples on and around 4/6/93 and 6/18/93 indicate that radionuclides are significantly lower than ARAR levels No problems or maintenance occurred on these dates The possibility of crossed samples, laboratory contamination or FTU system failure are all being investigated

3 6 RS-8 (SLUDGE)

Preliminary data indicates that all VOC samples for the sludge taken during this sample period contain no VOCs Radionuclide and metals data for this reporting period have not been received for this sample location Due to process knowledge, all sludge generated at the FTU is packaged as low-level mixed waste EPA waste code F001 (spent chlorinated solvents) has been determined to be the appropriate waste code for characterizing the waste

4 0 OPERATIONS SUMMARY

Operations of the FTU was taken over by a new subcontractor on May 1, 1993 Reidel Environmental Services, Inc , provided two months of on-the-job training (March and April) to the new subcontractor, Resource Technology Group, Inc (RTG) Reidel Environmental Services had operated the FTU throughout the startup of both Phase I and Phase II operations RTG initially designed and supplied the Phase II chemical precipitation/microfiltration units, and has operated several similar systems at other DOE facilities

Standard Operating Procedures (SOPs) were drafted and adopted for use for all activities at the treatment facility

A sludge reduction program was initiated during the last two weeks of December This program may potentially reduce the amount of sludge generated at the FTU by approximately 50% The sludge reduction will be accomplished by using 25% sodium hydroxide (liquid) to control the pH in the second reaction tank (TK-2) and reducing the amount of calcium hydroxide (lime) injected into the tank Two weeks of operation indicate no adverse affects have been noticed, and preliminary indications show a sludge reduction greater than 50% by volume Additional data must be collected to determine the actual amount of sludge reduction that is being accomplished This sludge reduction program will result in an annual reduction of approximately ninety 55-gallon drums of low-level mixed waste that is produced at the FTU Efforts will continue to be made to reduce any waste generated at the FTU

Nine additional microfiltration membranes (0 1 micron) were procured by EG&G and installed into the Rads Removal System (RRS) on November 20, 1994 The additional membranes will increase the treatment capacity through the RRS by 33%, and reduce/eliminate any further shutdowns due to plugged membranes resulting in low flows Chemical usage will also be reduced by approximately 33% during chemical cleaning cycles since the same quantity of chemicals will be used to clean membranes that have treated 33% more water

Additional containment (80 mil HDPE membrane) was placed under all three treatment trailers to assure that any spills that may occur will be fully contained

5.0 ENVIRONMENTAL COMPLIANCE

The addition of tertiary containment under the three treatment trailers will prevent any potential spills from reaching the environment

On December 4, 1993, approximately ten gallons of untreated influent water spilled into the soil directly under the influent line when it developed a leak Appendix C contains the RCRA Contingency Report, and Appendix D contains a risk assessment performed by EG&G to determine the risk resulting from the spill

6 0 REPORTS/CORRESPONDENCE

During this reporting period, the following reports/documents that pertained to the OU-2 FTU were generated

Report from M T Vess to Distribution (see Appendix B) entitled Membrane Failure Resulting in Shutdown of Operations at the Operable Unit Number 2 Field Treatability Unit, dated November 30, 1993

Report from N M Hutchins to M H McBride (see Appendix B) entitled Membrane Failure Resulting in Shutdown of Operations at the Operable Unit Number 2 Field Treatability Unit, dated December 17, 1993

Resource Conservation and Recovery Act (RCRA) Contingency Plan Implementation Report No 93-010 (see Appendix C)

Letter from Frederick Dowsett, Chief monitoring and Enforcement Hazardous Waste Control Program for the Colorado Department of Health to Thomas Lukow (DOE),concerning the decision by EG&G not to remediate the soil affected by the December 4, 1993 ten gallon spill of untreated influent water

Bounding Risk Assessment for OU-2 Treatability System Spill from R S Roberts to M C Broussard (see Appendix D)

Letter from M T Vess to A L Primrose concerning the procurement and installation of a flowmeter on the SW132 influent collection system

Letter from M T Vess to E J Poling concerning EPA waste codes used on sludge drums from the OU-2 FTU

Letter from M T Vess to J R Fitzsimmons requesting review of sludge analytical data to assure proper EPA waste code identifications

Letter from J K Hartman to M Hestmark (EPA) and G Baughman (CDH) dated December 2, 1993 providing quarterly notification for periods of non-collection at the OU-2 FTU

Letter from N M Hutchins to J K Hartman dated November 4, 1993 providing quarterly notification for periods of non-collection at the OU-2 FTU

Letter from M H McBride (DOE) to M Hestmark (EPA) and G Baughman (CDH) dated December 2, 1993 providing quarterly notification for periods of non-collection at the OU-2 FTU

Letter from M T Vess to K D Anderson, M C Burmeister, and L A Nelowet requesting modifications to the OU-2 FTU Health and Safety Plan

Letter from M T Vess to A L Primrose dated 11/8/93 providing SW-59 Seep Diversion Description

Letter from J K Hartman to N M Hutchins dated 10/8/93 discussing SW-59 Seep Diversion and Modification to the OU-2 FTU Sampling and Analysis Plan

7.0 ANTICIPATED OPERATIONS FOR NEXT QUARTER

Normal operations are expected to continue next quarter No shutdowns (other than routine generator servicing and permanent power installation) are expected at the treatment facility

Methods for reducing the volume of sludge will continue to be explored EG&G and the O&M subcontractor RTG will continue to explore reducing the volume of sludge generated per volume of water treated

Installation of permanent plant power to the FTU is expected to begin in March, 1994 Engineering design and cost estimates have been completed

Modifications will be made to the sampling and analysis plan for the FTU A net reduction in samples, along with onsite analysis of other samples will result in a significant cost savings

Water collected from the OU-2 Vapor Extraction Unit will be treated at the OU-2 FTU when the unit is operational The water will be sampled to assure that it is compatible with the FTUs treatment capabilities At this time estimates range from zero to twenty-thousand gallons of collected water during the first month

Purge water collected from contaminated wells may be treated at the FTU All purge water will

be sampled to determine the best facility to treat the water Possibilities for treatment include the OU-1 IM/IRA (Bldg 891), OU-2 IM/IRA FTU, 374 Evaporator, and the Sewage Treatment Plant Each facility is limited by certain contaminants, so sampling would determine the final destination

Liquids from ACCUVAC vials may be treated at the FTU The liquids contain levels of chromium that qualify it as a Resource Conservation and Recovery Act (RCRA) hazardous waste At this time the total volume is estimated to be less than fifty gallons

Purge water from the Ground Water Sampling Program may be treated at the FTU if no other facility can treat the RCRA regulated water

8 0 SUMMARY/CONCLUSIONS

The OU-2 FTU continues to collect and treat contaminated surface water from the South Walnut Creek Basin 24-hours per day, 375-days per year Process improvements have reduced both operating costs and generated hazardous waste Waste reduction, chemical use reduction, and treatment facility optimization will also continue to be explored/implemented in order to make the FTU a more efficient operable unit

If approval is granted to discontinue collection of SW-61 and/or SW132, the FTU would become available to treat water from other Rocky Flats Plant sources Simple modifications could be made to allow the facility to accept higher levels of contaminants The addition of effluent holding tanks would allow the FTU to treat other waters and hold the treated water until analytical results verify that it is acceptable for discharge to the South Walnut Creek Basin

Appendix A

OU-2 FTU ARARs

TABLE 1
Surface Water Contaminants
Identified in the South Walnut Creek Basin IM/IRAP[1,2]

Analyte	Unit	Average Concentration	ARAR
Radionuclides			
Am-241	pCi/l	0 53	0 05
Gross alpha	pCi/l	730 00	11 00
Gross beta	pCi/l	545 00	19 00
PU-239/240	pCi/l	3 28	0 05
U-total	pCi/l	11 69	10 00
VOCs[3]			
1,1-Dichloroethene	µg/l	142	7 00
Carbon Tetrachloride	µg/l	219	5 00
Chloroform	µg/l	82	1 00
Tetrachloroethene	µg/l	279	1 00
Trichloroethene	µg/l	153	5 00
Vinyl Chloride	µg/l	-	2 00
Metals-Dissolved			
Iron	µg/l	-	300 00
Manganese	µg/l	0 5790	50 00
Metals-Total			
Aluminum	µg/l	25 1214	200 00
Arsenic	µg/l	-	50 00
Barium	µg/l	1 8530	1,000
Beryllium	µg/l	0 0519	100 00
Cadmium	µg/l	0 0132	5 00
Chromium	µg/l	0 1918	10 00
Copper	µg/l	0 2664	25 00
Iron	µg/l	183 964	1,000
Lead	µg/l	0 1954	5 00
Manganese	µg/l	3 3068	1,000
Mercury	µg/l	0 0022	0 20
Nickel	µg/l	0 2239	40 00
Selenium	µg/l	0 0070	10 00
Zinc	µg/l	1 3475	50 00

1 From the IM/IRAP (DOE, 1991)
2 Only anilities with ARARs are presented
3 Analyzed by EPA Method 524 2
- Not calculated in the IM/IRAP

APPENDIX B

11/15/93 Membrane Failure Report

MEMBRANE FAILURE RESULTING IN SHUTDOWN OF OPERATIONS AT THE OPERABLE UNIT NUMBER 2 FIELD TREATABILITY UNIT

Prepared by

EG&G ROCKY FLATS

ENVIRONMENTAL RESTORATION
ENVIRONMENTAL OPERATIONS MANAGEMENT

November 30, 1993

1.0 SCOPE

This report will describe the series of events that occurred from November 15 to November 20, 1993, at the Operable Unit Number 2 (OU-2) Field Treatability Unit (FTU) as a result of the membrane failure that occurred on November 15, 1993

2 0 History

The OU-2 FTU began removing Volatile Organic Compounds (VOCs) from surface water sites east of the Protected Area at the Rocky Flats Plant in May of 1991 In April, 1992, chemical precipitation and microfiltration was added to the FTU to remove radionuclides and metals The facility is required to collect and treat surface water (up to sixty gallons per minute) twenty-four hours per day, 365 days per year Operations and Maintenance of the OU-2 FTU is performed by subcontractors, with an EG&G project manager assigned to the project for oversight and guidance

3.0 History of Events

Date	Time	Activity
11/15/93	16 15 hrs	During normal operations, a blank membrane (lower train, eastern blank) failed, rendering the system inoperable The 6" I D PVC pipe is rated for an operating pressure of 180 psi The failure occurred during normal operating conditions, with a pipe pressure of 46 psi, well below the rated operating pressure of 180 psi for the blank membrane (which consists of 6" I D PVC pipe) The failure caused several hundred gallons of process water to spill into the secondary containment The microfiltration system (which consists of the membranes) is located in trailer T900A See Attachment A for system diagram Collection of surface water ceased at this time
	16 25 hrs	Subcontractor (RTG, Inc), notified EG&G Project Manager (M T Vess) of the membrane failure
	16 50 hrs	Environmental Operations Manager (M C Broussard) notified of occurrence by EG&G Project Manager (PM)
	17 00 hrs	Radiological Engineering (J L Anderson) briefed of occurrence, and determined that there was no radiological concern As a precaution, radiological and VOC monitoring was performed (no detectable contaminants)
	17 00 hrs	Subcontractor began pumping water from secondary containment into the concentration tank (TK-8), located in Trailer T900A Began to clean trailer
	17 05 hrs	Cause of spill identified as a material failure of the blank membrane Appendix B shows photographs of the failure

Date	Time	Activity
11/15/93	17 29 hrs	Shift Superintendent notified of occurrence by Environmental Operations Manager, and briefed by PM No actions required or taken by the Shift Superintendent
	18 00 hrs	Shift change (subcontractor) Shift safety meeting held discussing cleanup precautions Continued cleaning trailer
11/16/93	05 45 hrs	Replacement part is being shipped via air freight (from Billerica, MA) and is scheduled for arrival at Stapleton at 18 17 hours Continued cleaning up from spill all day. PM requested a work package and Lock Out/Tag Out (LO/TO) to repair the system
	18 00 hrs	Shift change, began preparing to install new blank membrane upon arrival
	19 40 hrs	Replacement part onsite, began installing (work control number TR073051)
	20 30 hrs	Replacement of new blank membrane complete LO/TO removed and the system was tested by recirculating clean water from tank TK-10 through the membrane system using the cleaning pump Pressure rose rapidly when water reached the top membrane train System was shut down and a new work control (TR073039) was issued to LO/TO and repair the system again Night shift began removing membranes from the system to inspect for fouling or plugging
11/17/93	05 30 hrs	PM onsite to evaluate removed membranes Membranes were severely clogged, and required cleaning PM began getting authorization to clean the membranes at the Main Decontamination Facility (MDF)
	06 00 hrs	Shift change Subcontractor began preparing to clean membranes at the MDF Continued to remove membranes from the system
	12 00 hrs	Began cleaning clogged membranes at MDF
	16 30 hrs	MDF out of clean water, beginning to experience freezing conditions Unable to clean any more membranes today Three of the nine membranes from the top train cleaned today Night shift cleaned T900A (from membrane removal activities)
11/18/93	08 00 hrs	Informed that the MDF could not be used until some of the waste water could be transferred to Building 891 (Operable Unit Number 1) Protected Area (PA) decon pad will be used Began gathering pumps, hoses, generator, PPE, and membranes to transport into the PA

Date	Time	Activity
11/18/93	11 00 hrs	Could not get membranes into the PA Protective force requires X-rays of the membranes prior to allowing them into the PA. Arranged for Building 891 to accept a tanker of the MDF wastewater
	12 20 hrs	Took samples from the plugged membranes and placed in 100 ml solutions of HCl, hydrogen peroxide, NaOH and sodium hypochlorite to find best cleaning solution Hydrogen peroxide appeared to be the only solution that worked This will be used to clean the membranes once they are reassembled in the system
	14 00 hrs	Ten (10) new membranes ordered from Memtek to replace the blank membranes in the system This will increase the flow through the system by 33%, and will reduce the amount of chemicals used to perform chemical cleans of the membranes by 33% The additional flow will also significantly reduce any time that the FTU cannot collect water due to poor membrane flow
	15 40 hrs	MDF ready to clean membranes Due to cold weather and the time of day, cleaning of the membranes will occur first thing tomorrow morning Night shift cleaned up from day shifts activities
11/19/93	09 30 hrs	Began cleaning membranes at the MDF
	10 45 hrs	Began replacing cleaned membranes using manufactures recommended procedures (see Attachment C)
	15 50 hrs	Began removing blank membranes from system in order to be ready to install the new membranes tomorrow morning Made arrangements with Receiving, Transportation, Electricians, and Shift Superintendent to have the new membranes arrive onsite tomorrow (saturday), and for the LO/TO to be removed as soon as reassembly was completed
	18 00 hrs	Finished removing blank membranes Began cleaning and monitoring blank membranes to prepare them for storage
11/20/93	06 00 hrs	Shift change Began preparing for arrival of new membranes All tools, hardware, and paperwork being put in place at this time
	11 10 hrs	Membranes arrived on plantsite RTG left to pick them up from bldg 551
	11 45 hrs	Began installing new membranes
	15 05 hrs	Installation almost complete Notified LO/TO personnel that the locks would need removal soon
	16 30 hrs	LO/TO removal done

Date	Time	Activity
11/20/93	16 50 hrs	Tested system by pumping clean water from tank TK-10 through the system using the cleaning pump No leaks or problems detected System declared operational again
	17 20 hrs	Began chemical cleaning cycle using hydrogen peroxide to remove any addional sediments or sludge that remained in the membranes
	18 20 hrs	Placed system into recirculation until final pH was stabilized.
	19 30 hrs	Began discharging treated water
	19 40 hrs	Weirs turned on and began collecting surface water

4 0 Cause of Shutdown

The blank membrane failed as a result of a material failure in the 6" PVC piping The cause of the material failure appears to be a weak glued fitting The fitting failed at 46 psi, (normal operating pressure), which is below the rated working pressure of 180 psi for the membrane It is assumed that the poor glue fitting was initially capable of operating at the rated pressures, but due to nearly continuous operation of the facility for the last nineteen months, mechanical vibrations have most likely caused fatigue to occur at the weak fitting in the membrane

When the membrane ruptured, sludge was still in the membranes, and a solids flush to remove the sludge from the membranes could not be performed By not performing a solids flush, the top train of membranes to became severely plugged and required disassembly of the membrane system to remove the sludge

5 0 Results of Shutdown

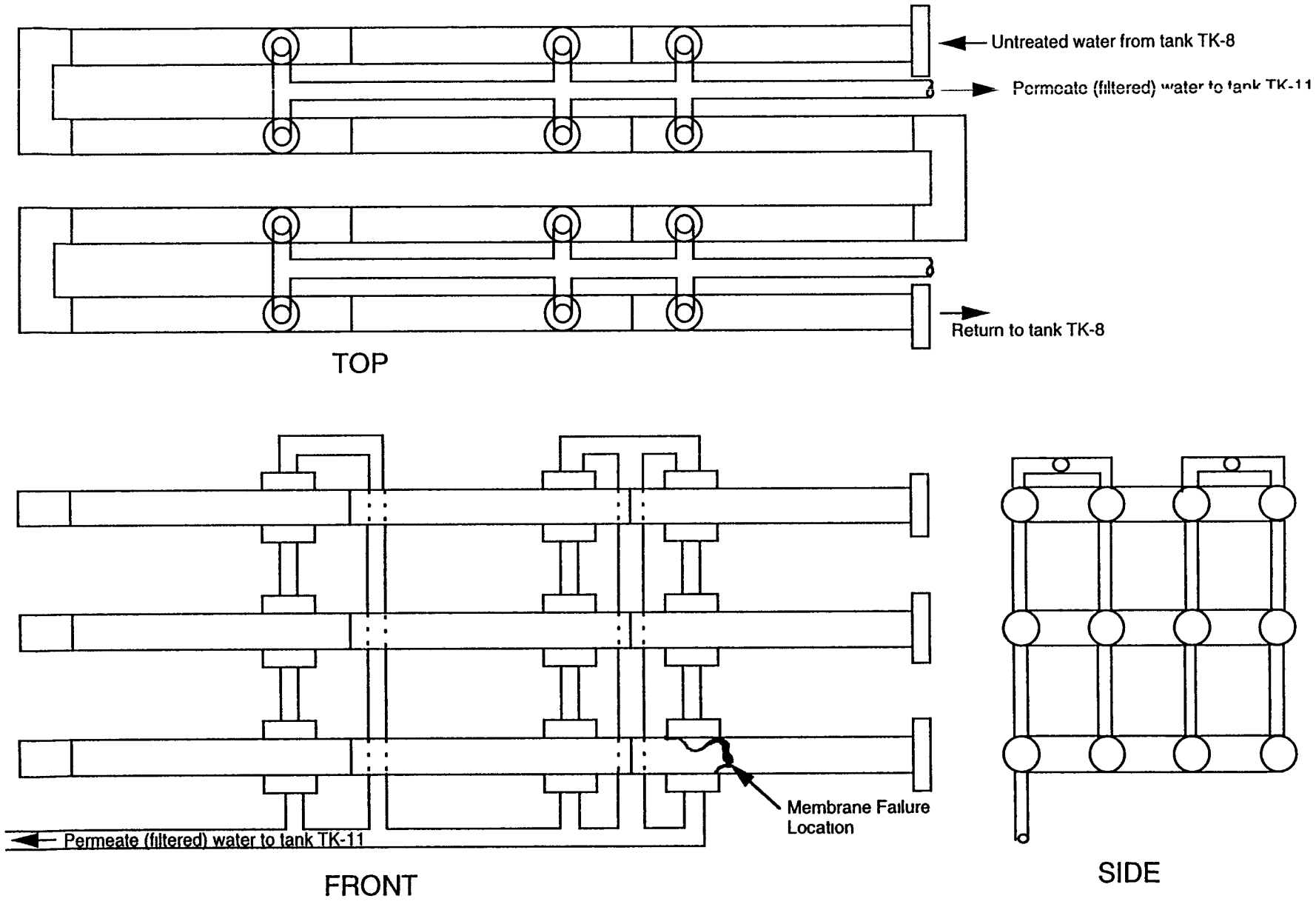
Surface water from Surface Water (SW) locations SW-59, SW-61, and SW-132 was not collected from the time of the rupture (16 15 hrs on 11/15/93) until 19 40 hrs on 11/20/93, for a total period of noncollection of five (5) days, three (3) hours, and twenty five (25) minutes The Colorado Department of Health (CDH) and the Environmental Protection Agency (EPA) were both notified of the shutdown and when the system was once again operational

6.0 Conclusion

The cause of the membrane rupture was a material failure of the 6" PVC blank membrane The failure occurred at normal operating pressures, well below the maximum operating pressure of the pipe Normal preventative maintenance could not have caught the problem prior to failure, as when the pipe failed it gave no warning (leaks) As a result of the membrane failing, a solids flush could not be performed, causing the upper membranes to become clogged All efforts were made to bring the facility back to an operable status, but due to the extent of the clogged membranes it took several days to perform the work During the shutdown, additional membranes were ordered and installed in the microfiltration system to increase the capacity of the system, reduce chemical use, and reduce periods of non-collection

APPENDIX A

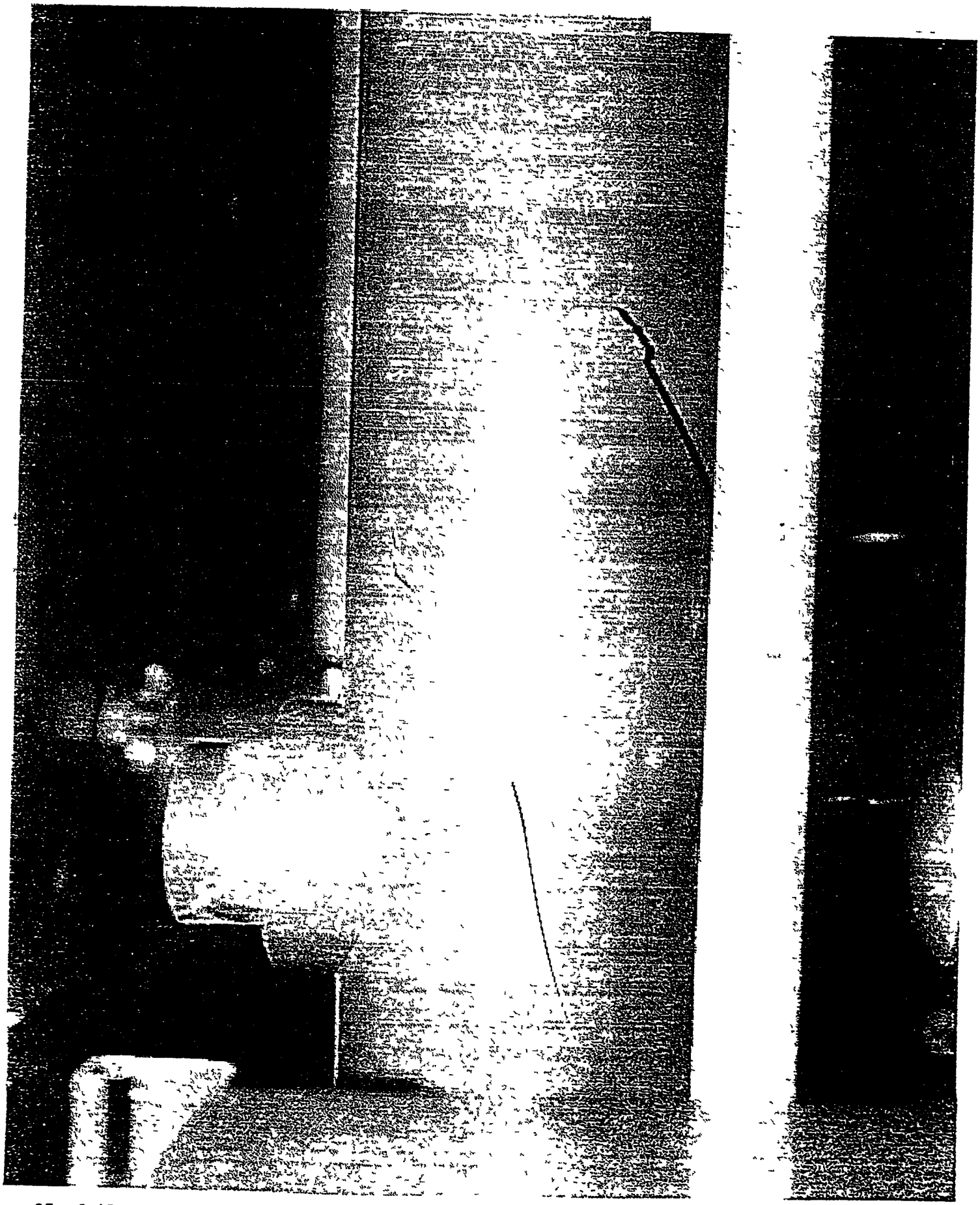
MICROFILTRATION SYSTEM DRAWINGS

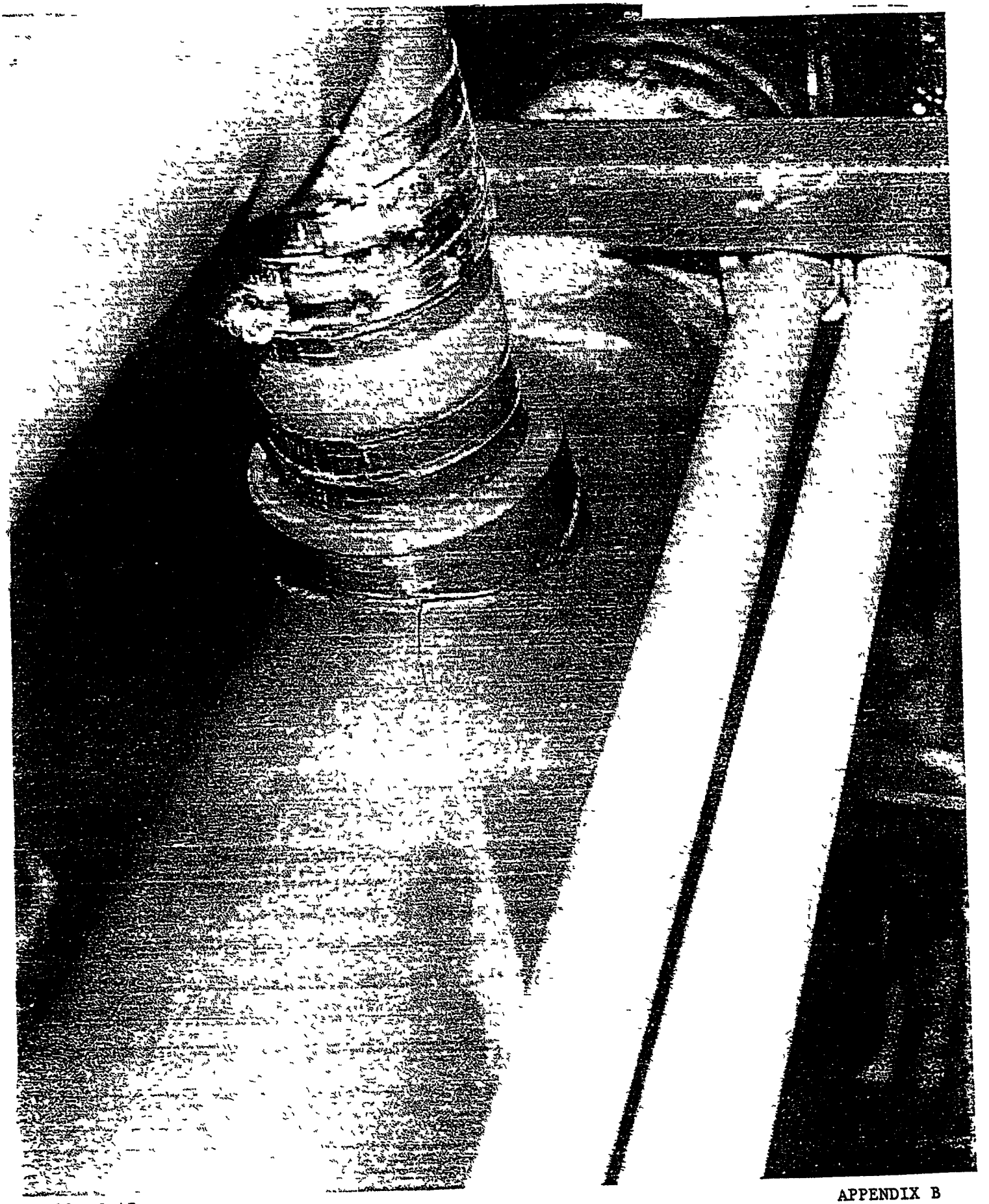


OPERABLE UNIT NUMBER 2 FIELD TREATABILITY UNIT - MICROFILTRATION UNIT

APPENDIX B

PHOTOGRAPHS
OF
MEMBRANE FAILURE





APPENDIX C

MANUFACTURES (MEMTEK) RECOMMENDED MEMBRANE REASSEMBLY PROCEDURE

PART # A2032
INSTALLATION INSTRUCTIONS

1 * Place the polypropylene shims into the superstrut where the modules are to be clamped

2 Install a victaulic gasket onto each end of the module.

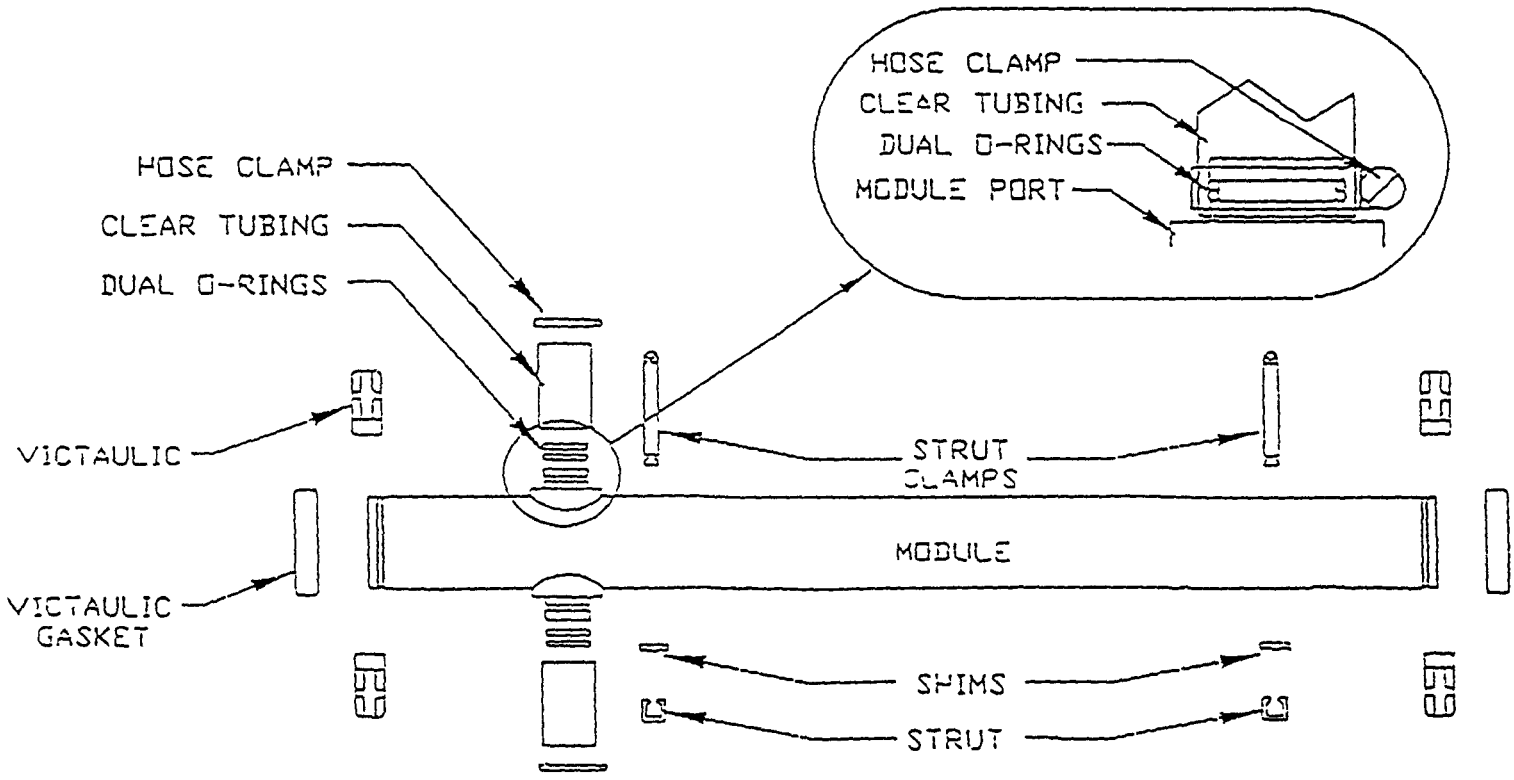
3 Place the module onto the shims and clamp lightly into position with the superstrut clamps.

4 Slide the victaulic gasket into position and install the victaulic coupling Insure that the filtrate and vent ports are aligned properly for later insertion into the clear tubing.

5 Install the o-rings into the grooves on the module filtrate and vent ports Note each port requires 2 o-rings

6. Install the clear tubing onto the filtrate and vent ports and tighten the hose clamps The hose clamps should be over the o-rings.

7. Tighten the superstrut clamps



* NOTE A - Shims are only required when installing a potted type module (Part # A2032) in place of a bundle/shell type module (Part # A1075)

B - Module keys are not required when installing (Part # A2032 Alignment is automatically achieved in the manufacturing process

APPENDIX C

RCRA Contingency Plan Implementation Report Number 93-010

CORRES CONTROL
INCOMING LTR NO

5322RF 93

DUE
DATE

ACTION

DIST.	LTR	ENC
BENEDETTI R L		
BENJAMIN A		
BERMAN H S		
CARNIVAL G J		
COPP R D		
CORDOVA R C		
DAVIS J G		
ERRERA D W		
FRANZ W A		
HANNI B J		
HEALY T J		
HEDAHL T G	X	X
HILBIG J G		
HUTCHINS N M	X	X
KIRBY W A		
LESTER A W		
MAHAFFEY J W		
MANN H P		
MARX G E		
McKENNA F G		
MORGAN R V		
PIZZUTO V M		
POTTER G L		
SANDLIN N B		
SATTERWHITE D G		
SCHUBERT A L	X	X
SETLOCK G H		
SULLIVAN M T		
SWANSON E R		
WILKINSON R B		
WILSON J M		
Broussard M.C.	X	X
Vess T	X	X
Demos N	X	X

CORRES CONTROL	X	X
PATS/T130G		
ADMN RECORD/080	X	X

Reviewed for Addressee
Corres Control RFP

12/20/93 DATE
BY

Ref Ltr #

DOE CRDER # 5482.1

RECEIVED
DEC 23 1993

Department of Energy

ROCKY FLATS OFFICE
P O BOX 928
GOLDEN COLORADO 80402-0928

DEC 20 11 29 AM '93

DEC 17 1993

EG&G
ROCKY FLATS PLANT
CORRESPONDENCE CONTROL

93-DOE-13662

Frederick R Dowsett, Ph D
Colorado Department of Health
Hazardous Materials and Waste Management Division
HHMWMD-HWC-B2
4300 Cherry Creek Drive South
Denver Colorado 80601

Dear Dr Dowsett

Enclosed is the Resource Conservation and Recovery Act (RCRA) Contingency Plan Implementation Report No 93-010, which documents the status and information concerning the release of approximately 10 gallons of hazardous waste from Operable Unit 2 The release occurred at approximately 2 30 PM , December 4, 1993 The Colorado Department of Health was notified by telephone and the Environmental Protection Agency was notified by facsimile on December 7,1993

If you have any questions regarding this subject, please contact the Environmental Restoration Facilities Manager, Marcella Broussard, at 966-8517

Sincerely,

Thomas E Lukow, Director
Waste Program Division

Enclosures

cc w/Enclosure
D Maxwell, EPA
B Brainard-Jordan, OC, RFO
T Lukow, WPD, RFO
P Cote, EMB, RFO
D Grosek, EMB, RFO
W Seyfert, EMB, RFO
M C Broussard, EG&G
T Hedhal, EG&G
T Vess, EG&G
A Schubert, EG&G
N Demos, EG&G

EG&G ROCKY FLATS

EG&G ROCKY FLATS, INC
ROCKY FLATS PLANT, P O BOX 464, GOLDEN, COLORADO 80402-0464 • (303) 966-7000

December 16, 1993

93-RF-15209

T E Lukow, Director
Waste Programs Division
DOE, RFO

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) CONTINGENCY PLAN IMPLEMENTATION REPORT (CPIR) NO 93-010 - TGH-665-93

Enclosed is a draft letter to the Colorado Department of Health (CDH) to transmit RCRA CPIR No 93-010, also enclosed The report outlines the events associated with the release of surface water potentially contaminated with hazardous waste to the environment from the transfer piping associated with Operable Unit (OU) No 2

This report should be delivered to CDH by no later than December 19, 1993 as required by 6 CCR 1007-3 Section 265 56(j)(1-7) The repairs to the system have been completed and the system was placed back into operation A release notification to the National Response Center was not required because analytical data was available and a reportable quantity of the "F-listed" constituents was not released

If you have any questions regarding this matter please call M C. Broussard at extension 8517, or E M Pasic at extension 2297

T G Hedahl, Associate General Manager
Environmental and Waste Management

EMP kam

Orig and 1 cc - T E Lukow

Enclosures
As Stated (2)

RCRA CONTINGENCY PLAN
Implementation Report No 93-010

RCRA CONTINGENCY PLAN
IMPLEMENTATION REPORT
ROCKY FLATS PLANT
EPA ID NUMBER CO7890010526

This report is made in compliance with the requirements of 6 CCR 1007-3, Parts 264 56 (j) and 265 56 (j) for a written report within 15 days of the implementation of the RCRA Contingency Plan The requirements for this are given below and will be addressed in the order listed, excerpted from 6 CCR 1007-3, Parts 264.56 and 265 56

"(j) Within 15 days after the incident, he must submit a written report on the incident to the department The report must include

(1) Name, address, and telephone number of the owner or operator
(2) Name, address, and telephone number of the facility
(3) Date, time, and type of incident (fire, explosion)
(4) Name and quantity of material(s) involved
(5) The extent of injuries, if any
(6) An assessment of actual or potential hazards to human health and the environment, where this is applicable, and
(7) Estimated quantity and disposition of recovered material resulted from the incident "

---

(1) NAME, ADDRESS AND TELEPHONE NUMBER OF THE OWNER OF THE FACILITY

United States Department of Energy
Rocky Flats Plant
Post Office Box 928
Golden, Colorado 80402
(303) 966-2025

Facility Contact
M N Silverman, Manager

(2) NAME, ADDRESS AND TELEPHONE NUMBER OF THE FACILITY

U S Department of Energy
Rock Flats Plant
Post Office Box 928
Golden, Colorado 80402
(303) 966-2025

(3) DATE, TIME, AND TYPE OF INCIDENT

A. SUMMARY:

The RCRA Contingency Plan was implemented on December 4 ,1993, due to a release to the environment of approximately 10 gallons (thirty to forty gallons to secondary containment) surface water potentially contaminated with hazardous waste collected from Walnut Creek. The water is diverted from the creek as part of a treatability study for OU No 2 The contaminated water is treated in a Chemical Precipitation/Microfiltration/Granular Activated Carbon System The treated water is then returned to the creek

The release occurred at 2 30 pm, Saturday, December 4, 1993 A subcontractor employee discovered the release from an influent water line in response to an alarm signaling that a release had occurred The contractor noticed a slow leak coming from a connection in the secondary containment portion of the influent pipeline The primary pipeline was found to be leaking from a hole in the line The estimated amount of material released to the environment is 10 gallons by visual determination of the size of the wetted area Constituents found in the contaminated water support the fact that the contaminated water is an "F001" listed hazardous waste

An emergency work package was initiated to repair the line The line was repaired and returned to service on Wednesday, December 8, 1993 The released material was not directly recoverable because it soaked into the soil Based on previous analytical results of the contaminated water, the immediate removal of the affected soil is not required because the contaminant concentrations in the soil should not pose an unacceptable risk to human health and the environment This RCRA CPIR will be addressed in the quarterly update of the Historical Release Report

B SYSTEM DESCRIPTION·

The system involved with this incident was originally installed in May 1991 The influent line is approximately 1000 feet from the inlet at the creek to the primary tank system The line has secondary containment and is equipped with electronic sensors at the low points of the line to signal a leak or release of material into the secondary containment system The line leads into the system that consists of numerous tanks, filters and treatment columns (See figure 1 for a diagram of the treatment system) The pipeline is a partial diversion system for the transfer of creek water to the treatment system The pipeline is insulated with styrofoam and has a heat trace for winter operation This OU No 2 treatment facility is a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Interim Measure/Interim Remedial Action (IM/IRA) facility and is mandated by the Interagency Agreement (IAG) No Individual Hazardous Substance Site (IHSS) was involved in this incident

C. DESCRIPTION OF INCIDENT

A release of potentially contaminated water from an influent pipe system leading from Walnut Creek to the treatment system occurred due to a hole in the primary line The release was discovered at 2 30 p m on Saturday, December 4, 1993 A subcontractor employee discovered the release from an influent water line in response to an alarm signaling that a release had occurred The line in question has secondary containment The line was found to be leaking due to a separation of two pipes that make up the secondary pipeline The pumps was immediately shut down and contractor personnel visually inspected the line for a release The point of the release was discovered under a road culvert

D CORRECTIVE ACTION.

The pumps were de-energized immediately after the leak was discovered Subcontractor personnel immediately began repairs on the pipe An emergency work package was completed to temporarily repair the line The incident was not reported to the Emergency Operations Center (EOC), or the Shift Superintendent (the Rocky Flats Plant RCRA Emergency Coordinator) at the time of the incident A report was made to the EOC on Monday December 6, 1993, at approximately 4 30 pm The pipeline was repaired and the system was back in operation on December 8, 1993 The pump was re-energized and the system was returned to normal operation A letter has been written and will be sent to the responsible supervisors outlining release response and reporting requirements at the Rocky Flats Plant Plans are being made to permanently replace the pipeline to minimize the likelihood of a reoccurrence of a release from this system

(4) EQUIPMENT STATUS·

The system was repaired and returned to normal operation on December 8, 1993 The daily inspections of the pipeline are continuing

(5) NAME AND QUANTITY OF MATERIAL INVOLVED

Due to the fact that the water in Walnut Creek can contain hazardous waste, a determination has been made by the EG&G Rocky Flats Plant, that the "contained in rule" is applicable, and the water entering from the OU2 treatment system contains "F001" listed hazardous waste

Approximately thirty to forty gallons of hazardous waste was released from the inlet pipe transfer system to secondary containment and approximately 10 gallons was estimated to have been released to the environment Estimation was done by the area wetted by the release The water is collected from SW-59, SW-61 and SW-132 [most of which is surface runoff from within the Protected Area (PA)] The potentially contaminated water is treated for removal of volatile organic, soluble metals, and radioactive constituents The water is sampled weekly for characterization F001 listed hazardous waste constituents have been detected in trace amounts in the influent water The most recent sample date from the time of the incident was conducted December 8, 1993 The F001 listed contaminants that have been detected are carbon tetrachloride, methylene chloride, trichloroethene and tetrachloroethene Additionally, chromium and 1,2-dichloroethene, chloroform, 1,1-dichloroethane, and 1,1-dichloroethene have been detected in the influent water but not at levels that would make the water a characteristic hazardous waste The chemical 1,2 dichlorethylene has also been detected in the influent Other contaminants that have been tested for but not found are acetone,vinyl chloride, barium, cadmium, lead and mercury These analytical results come from over 100 sampling events that took place from May 29, 1991, to December 8, 1993 (refer to Tables 1 and 2) The series of samples were taken to determine the constituents that may be present in the water The water is also sampled weekly on a continuing basis The result of previous sampling are listed in Table 1 and 2

(6) EXTENT OF INJURIES.

There were no injuries During the repairs to the pipeline, the contractor personnel wore the proper protective clothing

(7) AN ASSESSMENT OF ACTUAL OR POTENTIAL THREAT TO HUMAN HEALTH AND ENVIRONMENT:

The released material was not directly recoverable because it soaked into the soil Based on the analytical results, the immediate removal of the affected soil is not required because the contaminant concentrations in the soil do not pose an unacceptable risk to human health and the environment This RCRA Contingency Plan Implementation Report will be addressed in the quarterly update of the Historical Release Report

(8) ESTIMATE QUANTITY AND DISPOSITION OF RECOVERED MATERIAL THAT RESULTED FROM THE INCIDENT·

None of the material was recovered

TABLE 1

Baseline Data for Influent Dissolved and Total Metals (mg/L) **

Analyte	Highest Value Detected (mg/L)	CRDL (mg/L)	RCRA TCLP Regulatory Limit (mg/L)
Barium (D005)	Below Detection Limit	0 200	100 0
Cadmium (D006)	Below Detection Limit	0 005	1 0
Chromium (D007)	.015	0 010	5 0
Lead (D008)	Below Detection Limit	0 003	5 0
Mercury (D009)	Below Detection Limit	0 0	0 2

CRDL - Contract Required Detection Limit
TCLP - Toxicity Characteristic Leaching Procedure

TABLE 2
VOLATILE ORGANIC COMPOUNDS *

Analyte	Highest/Average Value Detected (mg/L)	SDWA MCLs (mg/L)	RCRA TCLP Regulatory Limit (mg/L)
Trichlorethene (F001) (D040)	0 051/0 016	0 005	0 50
1,2-Dichloroethene (D028)	0 043/0 016	0 005	0 50
Carbon tetrachloride (F001) (D019)	0 082/0 024	0 005	0 50
Tetrachloroethylene (F001) (D039)	0 052/0 014	0 005	0 70
1,2-dichloroethylene (U079)	0 038/0 017	0 070	-
Methylene Chloride (F001)	0 001/0 0002	-	-
1,1-Dichloroethene (D029) (U078)	0 003/0 0006	0 007	0 07
Chloroform (D022)	0 012/0 004	-	6 00

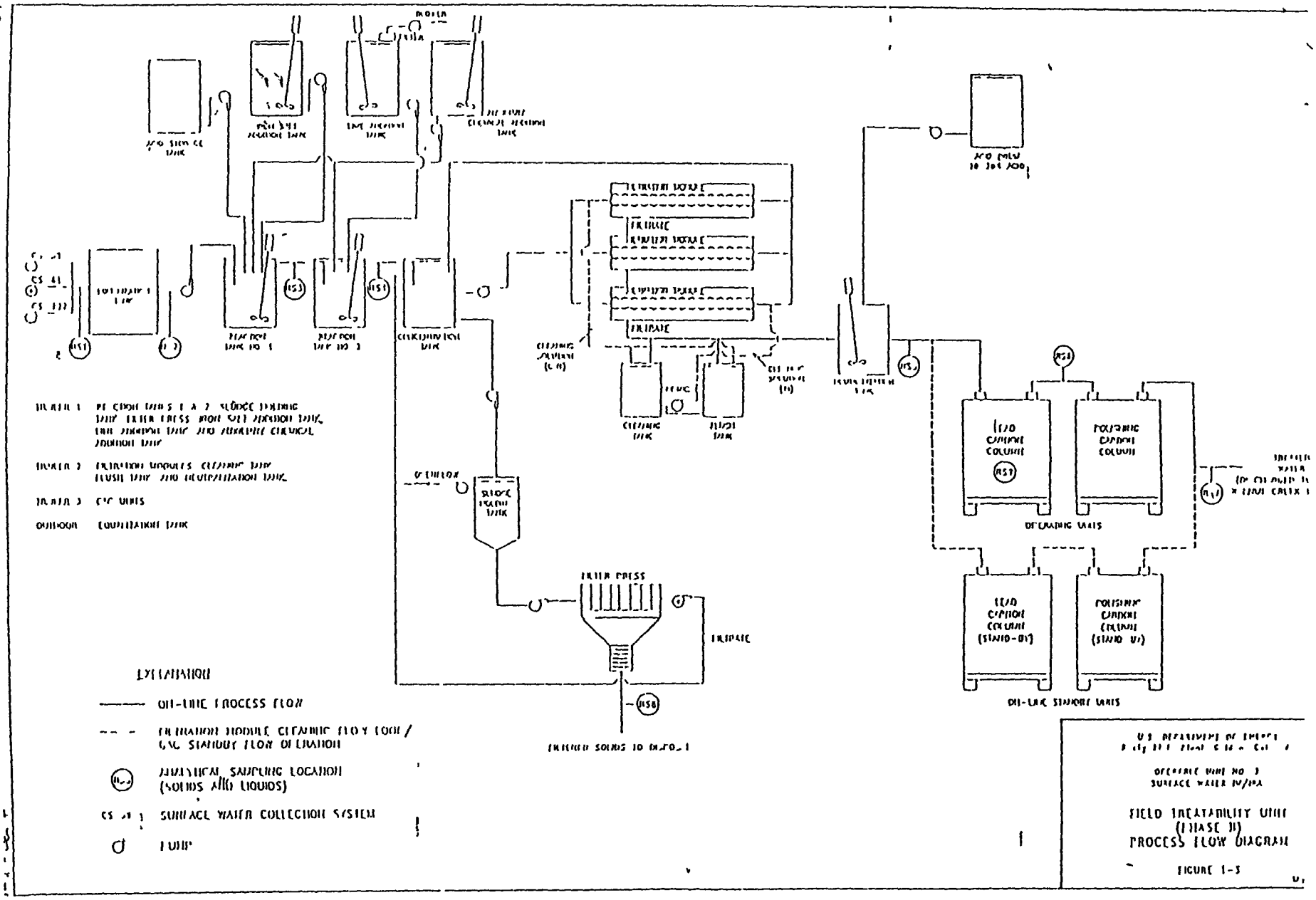
MCLs - Maximum Contaminant Levels - No Standards Listed

SDWA - Safe drinking Water Act

Volatile Organic Compounds Sampled for but not found.

Acetone	(F003)
Vinyl Chloride	(D043)

* (Based on weekly sample events for the third quarter of 1993)
** (Based on sampling events from 05/92 to 2/11/92)


FILTER PRESS
FILTRATE
FILTERED SOLIDS TO DISPOSAL
DEGRADING UNITS
OIL-LIKE STANDBY UNITS
EXPLANATION
OIL-LIKE PROCESS FLOW
FILTRATION MODULE CERAMIC FLOW LOOP / G/L STANDBY FLOW OPERATION
SURFACE WATER COLLECTION SYSTEM
PUMP
OPERABLE UNIT NO 3
SURFACE WATER OU/RA
FIELD TREATABILITY UNIT
(PHASE II)
PROCESS FLOW DIAGRAM
FIGURE 1-3

APPENDIX D

Risk Assessment for 12/4/93 Spill at the OU-2 FTU

EG&G ROCKY FLATS

INTEROFFICE CORRESPONDENCE

DATE January 7, 1994

TO M C Broussard, EOM, Bldg 080, X8517

FROM R. S Roberts, EE&T, Bldg 080, X8508

SUBJECT BOUNDING RISK ASSESSMENT FOR OU 2 TREATABILITY SYSTEM SPILL - RSR-001-94

A bounding risk assessment was performed on the water present in the OU 2 treatability system The results of this analysis are attached and show that·

- The carcinogenic risk of a residential receptor drinking the OU 2 treatability water for 30 years is 6 2 X 10^{-06} which is well within the Environmental Protection Agency's (EPA) acceptable risk range of 10^{-04} to 10^{-06}.
- The non-carcinogenic hazard quotient of the same receptor is 0 15 which is less than 20% of the EPA's acceptable hazard quotient of 1

Given the extreme conservativeness of the risk calculations, the water at the OU 2 treatability study unit poses an acceptable risk to humans

The conservative methodology used in this report was the same as was used in the OU 2 Phase II Field Treatability Study dated July 1993 EPA comments have been raised on this methodology Since this project was urgent, there was no time for comment resolution

If you have any questions or comments, please contact me

RSR cet

Attachment
As Stated

cc
G M Anderson
M C Burmeister
W S Busby
J K Hopkins
P J Laurin
R E Madel
A L Primrose
M T Vess

EG&G ROCKY FLATS, INC , ROCKY FLATS PLANT, P O BOX 464, GOLDEN, COLORADO 80402-0464 (303) 966-7000

HUMAN HEALTH RISK ASSESSMENT
OU 2 TREATABILITY WATER SPILL

SUMMARY

This human health risk assessment was performed to ascertain the human health risks posed by the water in the water in the OU 2 treatability system The results of this risk assessment show that

- The carcinogenic risk of a residential receptor drinking the OU 2 treatability water for 30 years is 6 2 X 10^{-06} which is well within the Environmental Protection Agency (EPA) acceptable risk range of 10^{-04} to 10^{-06}
- The non-carcinogenic hazard quotient of the same receptor is 0 15 which is less than 20% of the EPA's acceptable hazard quotient of 1

These findings show that the water in the OU 2 treatability system pose an acceptable human health risk

RISK ASSESSMENT METHODOLOGY

To perform the risk assessment, accepted methodologies outlined in Risk Assessment Guidance For Superfund, Volume I, Human Health Evaluation Manual (Part A) were used The bounding risk assessment exposure scenario was chosen to be a person living near to the OU 2 treatability unit It was projected that this person would drink only water from the OU 2 unit for 350 days/year over 30 years This person will drink 2 liters/day These parameter values are defined by the Environmental Protection Agency (EPA) as Reasonable Maximum Exposure (RME) values and are sanctioned for use by the EPA This scenario is extremely conservative since

- The likelihood of a residence being constructed on OU 2 is quite small The source of chemicals in the environment are located on and at the bottom of a slope This area is not conducive to residential development (i e , it consists of both small wetland areas and sloped terrain) In addition, future land use of the Rocky Flats Plant (RFP) in the currently developed portions of the facility is anticipated as industrial use If there were to be residential construction on the RFP, it would likely be at some distance from the industrialized areas, rather than directly adjacent to them
- Because sufficient amounts of potable water from a municipal water supply would likely be available if the area were developed, it is probable that a future resident would utilize this more dependable and more readily available source of water
- It is assumed that the surface water from OU 2 is not augmented by other drinking supplies This assumption does not take into account fluid intake from other sources (i e , bottled drinks, other drinking water sources, etc)
- The risk assessment assumes no treatment of the water prior to consumption Typical treatment for surface water supplies consist of filtering and chlorination Activated carbon units to adsorb organics are also in use

The first step in evaluating the human health risks after deciding upon the exposure scenario is to calculate an intake factor This factor is calculated separately for carcinogenic and non-carcinogenic effects This factor takes into account all constant parameters within the exposure scenario and are outlined in Attachment I The intake factor for carcinogenic effects is calculated to be 1 17x10^{-02} (Liter/(Kg-Day)) The intake factor for non-carcinogenic effects is calculated to be 2 74x10^{-02} (Liter/(Kg-Day))

In order to calculate human health risk, site-specific and chemical-specific parameters must be known The first site-specific values needed are the chemicals and metals deemed to be contaminants at the site For this risk assessment, a list of organics and metals detected at sampling point RS-2 in May,1993 for the OU 2 treatability system were provided All detected organics were used in the risk assessment, and these were Carbon Tetrachloride, Chloroform, 1,1-Dichloroethane, Cis-1,2-Dichloroethene, Tetrachloroethene, Toluene and Trichloroethene Water concentrations for these organics are outlined in Attachment II and Attachment III

Since there are naturally occurring metals in surface water, a background comparison was performed to assure that metals used in the risk assessment were actually above background Before performing this background comparison though, the standard practice of eliminating the essential nutrients magnesium, potassium, sodium, calcium and iron was performed Since there was a limited data set (e g , there were no more than two detects for any metal), an Upper Tolerance Limit (UTL) comparison was performed as outlined in the Background Geochemical Characterization Report, dated September 30, 1993 The $UTL_{99/99}$ was used from the background report for surface water and spring/seeps This comparison showed that there were no metals above background

Chemical-specific oral slope factors and reference doses are required to calculate carcinogenic and non-carcinogenic effects respectively A search was performed in the Integrated Risk Information System (IRIS) on 1/6/94 for all detected organics IRIS was used as the primary source for slope factors and reference doses The 1993 annual update to the Health Effects Assessment Summary Tables (HEAST) was used as the secondary source All oral slope factors and reference doses are delineated in Attachment II and Attachment III, respectively If a detected organic did not have an oral slope factor in either IRIS or HEAST, it is not listed on Attachment II since carcinogenic risk could not be calculated The oral slope factors for tetrachchloroethene and trichloroethene were from Joan S Dollarhide, Superfund Health Risk Technical Support Center, "Carcinogenicity Characterization of Perchloroethylene (PERC) and Trichloroethylene (TCE) "(Luke Air Force Base, Arizona) If a detected organic did not have an oral reference dose in either IRIS or HEAST, it is not listed on Attachment III since a non-carcinogenic hazard quotient could not be calculated

The carcinogenic risk calculations are outlined in Attachment II The carcinogenic intake factor, organic concentration in water and oral slope factor are multiplied together to calculate the chemical-specific carcinogenic risk All chemical-specific risks are then summed to get an overall carcinogenic risk

The non-carcinogenic hazard quotient calculations are outlined in Attachment III The non-carcinogenic intake factor and organic concentration in water are multiplied together and then divided by the oral reference dose This will give chemical-specific hazard quotients All chemical specific hazard quotients are then summed to get an overall non-carcinogenic hazard quotient (Hazard Index)

RESULTS

The carcinogenic risk of a residential receptor drinking the OU 2 treatability water for 30 years is 6 2 X 10^{-06} which is well within the EPA acceptable risk range of 10^{-04} to 10^{-06} The non-carcinogenic hazard quotient of the same receptor is 0 15 which is less than 20% of the EPA's acceptable hazard quotient of 1

The above findings show that the water in the OU 2 treatability system pose an acceptable human health risk

INTAKE FACTOR EVALUATION ATTACHMENT I

SCENARIO DEFINITION

SCENARIO DESCRIPTION	RESIDENTIAL RECEPTOR DRINKS ONLY RAW OU 2 WATER FOR 30 YEARS
RECEPTOR TYPE	RESIDENTIAL
RECEPTOR PATHWAY	WATER INGESTION

PARAMETER DEFINITION

$$\text{INTAKE FACTOR} = \frac{(IR \times EF \times ED)}{(BW \times AT)}$$

ABBREVIATION	DESCRIPTION	VALUE
IR	INGESTION RATE	2 LITER\DAY
EF	EXPOSURE FREQUENCY	350 DAYS\YR
ED	EXPOSURE DURATION	30 YEARS
BW	BODY WEIGHT	70 KG
AT1	AVERAGING TIME (NON-CARCINOGENIC)	10950 DAYS
AT2	AVERAGING TIME (CARCINOGENIC)	25550 DAYS

INTAKE FACTOR CALCULATION

CARCINOGENIC REASONABLE MAXIMUM EXPOSURE

INTAKE FACTOR = 1 17E-02 LITER\(KG-DAY)

NON-CARCINOGENIC REASONABLE MAXIMUM EXPOSURE

INTAKE FACTOR = 2 74E-02 LITER\(KG-DAY)

CARCINOGENIC RISK EVALUATION ATTACHMENT II

SCENARIO DEFINITION

SCENARIO DESCRIPTION	RESIDENTIAL RECEPTOR DRINKS RAW OU 2 WATER FOR 30 YEARS
RECEPTOR TYPE	RESIDENTIAL
RECEPTOR PATHWAY	WATER INGESTION

PARAMETER DEFINITION

CARCINOGENIC RISK = (CIF x WC x SF x CF)

ABBREVIATION	DESCRIPTION	UNITS
CIF	CARCINOGENIC INTAKE FACTOR	LITER\(KG-DAY)
WC	WATER CONCENTRATION	UG\LITER
SF	ORAL SLOPE FACTOR	((MG)\(KG-DAY))^-1
CF	CONVERSION FACTOR	MG\UG

CARCINOGENIC RISK CALCULATION

CHEMICAL	CIF	WC	SF	CF	CARCINOGENIC RISK
CHLOROFORM	1 17E-02	7 00E-01	6 10E-03	1 00E-03	5 00E-08
CARBON TETRACHLORIDE	1 17E-02	3 00E+00	1 30E-01	1 00E-03	4 56E-06
TETRACHLOROETHENE	1 17E-02	2 00E+00	5 20E-02	1 00E-03	1 22E-06
TRICHLOROETHENE	1 17E-02	3 00E+00	1 10E-02	1 00E-03	3 86E-07
				TOTAL	6 22E-06

NON-CARCINOGENIC EVALUATION ATTACHMENT III

SCENARIO DEFINITION

SCENARIO DESCRIPTION	RESIDENTIAL RECEPTOR DRINKS RAW OU 2 WATER FOR 30 YEARS
RECEPTOR TYPE	RESIDENTIAL
RECEPTOR PATHWAY	WATER INGESTION

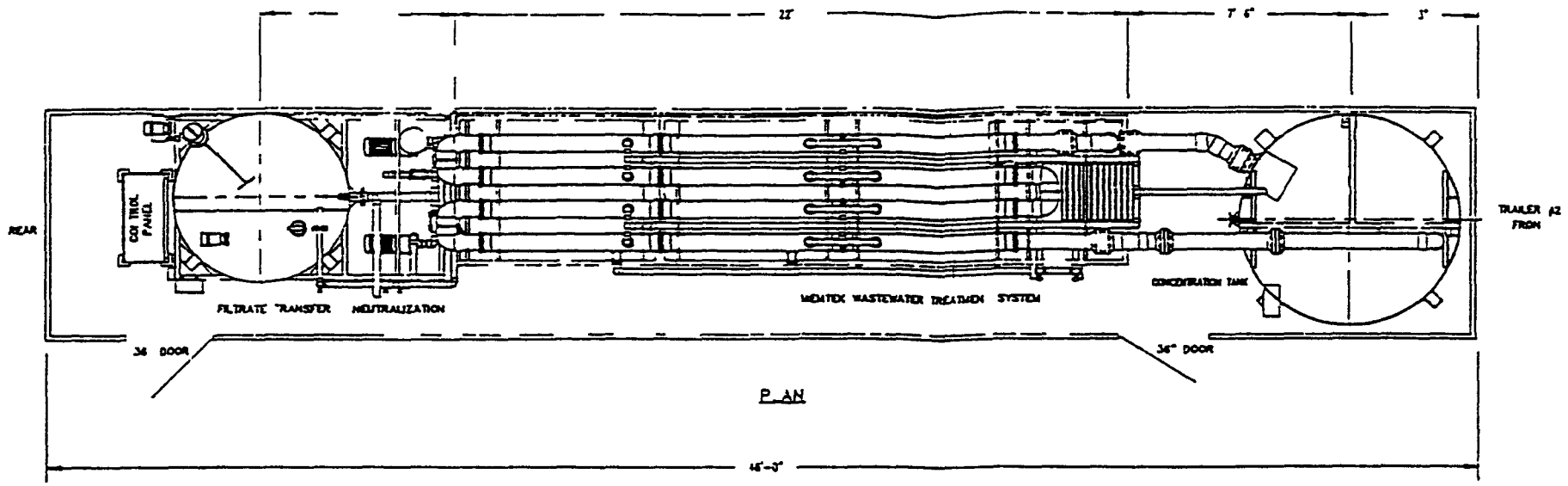
PARAMETER DEFINITION

NON-CARCINOGENIC HAZARD QUOTIENT (HQ) = (NCIF x MC x CF)/(RFD)

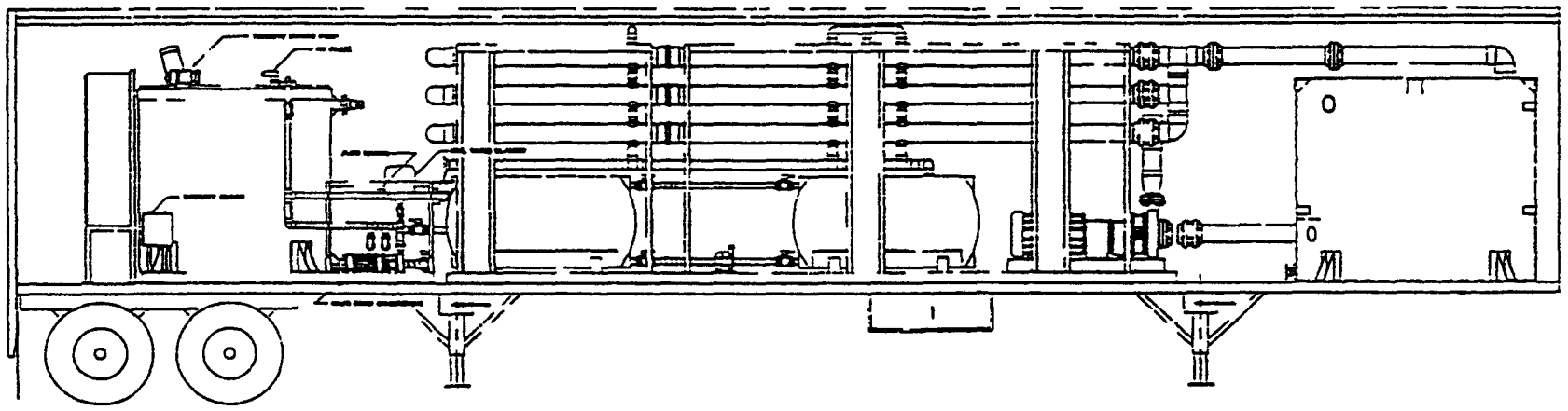
ABB	DESCRIPTION	UNITS
NCIF	NON-CARCINOGENIC INTAKE FACTOR	LITER\(KG-DAY)
WC	WATER CONCENTRATION	UG\LITER
CF	CONVERSION FACTOR	MG\UG
RFD	REFERENCE DOSE	(MG\(KG-DAY))

CARCINOGENIC RISK CALCULATION

CHEMICAL	NCIF	WC	CF	RFD	HQ
CARBON TETRACHLORIDE	2 74E-02	3 00E+00	1 00E-03	7 00E-04	1 17E-01
CHLOROFORM	2 74E-02	7 00E-01	1 00E-03	1 00E-02	1 92E-03
1 1-DICHLOROETHANE	2 74E-02	8 00E-01	1 00E-03	1 00E-01	2 19E-04
CIS,1,2-DICHLOROETHENE	2 74E 02	9 00E+00	1 00E-03	1 00E-02	2 47E-02
TETRACHLOROETHENE	2 74E-02	2 00E+00	1 00E-03	1 00E-02	5 48E-03
TOLUENE	2 74E-02	4 00E-01	1 00E-03	2 00E-01	5 48E-05
				TOTAL	1 50E-01



PLAN



ELEVATION

DWG. NO.	REFERENCE OR MARKS	REVISIONS		DRAWING STATUS	BY	DATE
				DESIGN		
				CHECKED		
				PRELIMINARY		
				FOR COMMENT AND APPROVAL		
				APPROVED FOR CONSTRUCTION		
				REVISED AND APPROVED FOR CONSTRUCTION		

CHEMICAL TREATMENT & MICROFILTRATION SYSTEM
TRAILER #2 GENERAL ARRANGEMENT

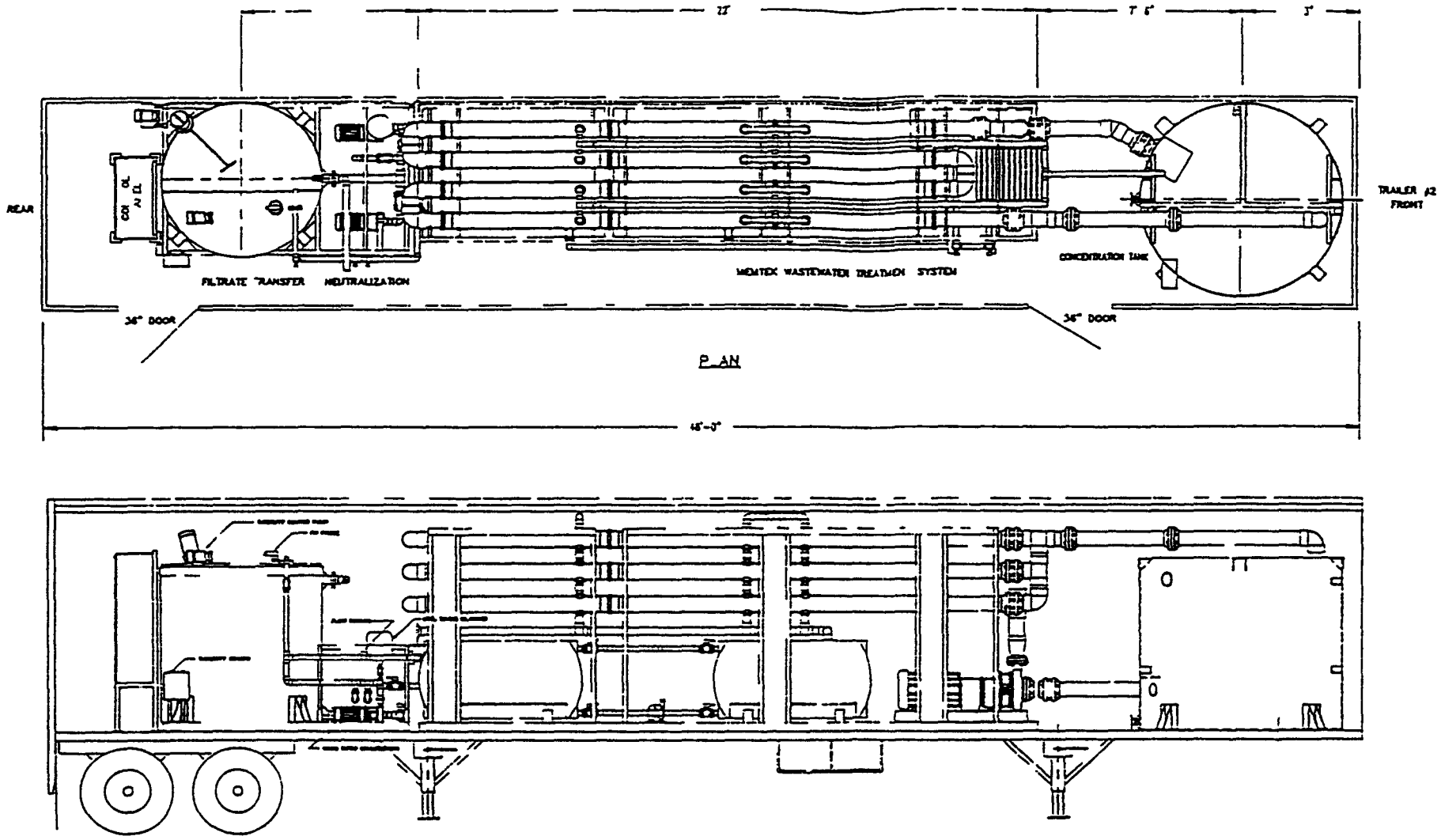
SCALE: NONE DRAWN BY: [illegible] PROJECT LOCATION: ROCKY FLATS PROJECT

RTG RESOURCE TECHNOLOGIES GROUP INC

DRAWING NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED AND DATED. ALL PRINTS ARE TO BE CONSIDERED MARKED AND DATED AND/OR REVISION MARKED

CLIENT: EG&G ROCKY FLATS, INC. GOLDEN, CO

DRAWING NUMBER: .03



PLAN

ELEVATION

DWG. NO.	REFERENCE DRAWINGS	REVISION

DRAWING STATUS	BY	DC
DESIGN		
CHECKED		
PRELIMINARY		
FOR COMMENT AND/OR APPROVAL		
APPROVED FOR CONSTRUCTION		
REVISED AND APPROVED FOR CONSTRUCTION		

CHEMICAL TREATMENT & MICROFILTRATION SYSTEM
TRAILER #2 GENERAL ARRANGEMENT

SCALE: NONE UNLESS | PROJECT LOCATION: ROCKY FLATS | PROJECT #

RESOURCE TECHNOLOGIES GROUP INC

DRAWING NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED AND DATED. ALL PRINTS ARE TO BE DESTROYED MARKED AS EARLIER DATE AND/OR REVISION NUMBER.

CLIENT: G&G ROCKY FLATS, INC. GOLDEN, CO

DRAWING NUMBER: 303